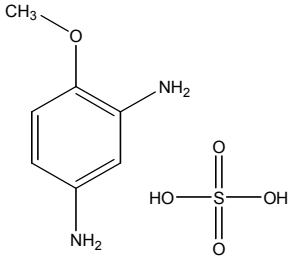
2,4-DIAMINOANISOLE SULFATE
CAS No. 39156-41-7
First Listed in the *Third Annual Report on Carcinogens*



CARCINOGENICITY

2,4-Diaminoanisole sulfate is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity in experimental animals (IARC S.4, 1982; IARC V.27, 1982). When administered in the diet, 2,4-diaminoanisole sulfate increased the incidences of thyroid follicular cell adenomas in mice of both sexes and thyroid follicular cell carcinomas in female mice. When administered in the diet, 2,4-diaminoanisole sulfate increased the incidences of squamous cell carcinomas, basal cell carcinomas, or sebaceous adenocarcinomas of the skin and its associated glands; malignant thyroid follicular cell tumors; and preputial or clitoral gland adenomas, papillomas, or carcinomas in rats of both sexes, and thyroid C-cell adenomas or carcinomas and Zymbal gland squamous cell carcinomas or sebaceous adenocarcinomas in male rats (NCI 84, 1978). In another study, when administered in the diet to female rats, 2,4-diaminoanisole sulfate induced mammary adenocarcinomas and carcinomas of the clitoral gland and increased the incidences of follicular cell adenomas or carcinomas and C-cell carcinomas of the thyroid (IARC V.27, 1982).

There are no adequate data available to evaluate the carcinogenicity of 2,4-diaminoanisole sulfate in humans (IARC V.27, 1982).

PROPERTIES

2,4-Diaminoanisole sulfate is an off-white to violet powder. It is soluble in water and ethanol. When heated to decomposition, it emits very toxic fumes of nitrogen oxides (NO_x) and sulfur oxides (SO_x). It is available commercially with a minimum purity of 80%.

USE

2,4-Diaminoanisole sulfate is used primarily as a component of oxidizing "permanent" hair- and fur-dye formulations. In 1978, about 75% of the hair-dye formulations contained 2,4-diaminoanisole or its sulfate. These two compounds are also intermediates in the production of C.I. Basic Brown 2, which is used to dye furs, acrylic fibers, cotton, wool, nylon, polyester, and leather and suede and is an ingredient of shoe polishes (IARC V.27, 1982). 2,4-Diaminoanisole sulfate is not presently used in consumer products under CPSC jurisdiction but is a component of cosmetic products.

PRODUCTION

No current data regarding production, export, or import of 2,4-diaminoanisole sulfate in the United States were located. The 1998 Chemical Buyers Directory and *Chemcyclopedia 98* did not identify any suppliers of the compound (Tilton, 1997; Rodnan, 1997). Chem Sources identified two U.S. distributors of 2,4-diaminoanisole sulfate in 1990 (Chem Sources, 1991). The 1997 *Directory of Chemical Producers* has no listing for the chemical (SRIa, 1997). A recent CPSC report indicates that 2,4-diaminoanisole sulfate is produced domestically by one company but states it is not used in any consumer products. The Commission also reports that the 1987 issue of the CPI Purchasing Directory shows one domestic importer, but this company says they no longer import the chemical. The Directory of Chemical Producers reported that one U.S. company produced an unknown quantity of 2,4-diaminoanisole sulfate in 1986 (SRIa, 1986). In 1979, EPA reported two producers and importers; no domestic production data were available, but the import estimate was 350 lb. The 1979 TSCA Inventory identified one domestic producer of 2,4-diaminoanisole sulfate in 1977, with no volume reported, and one company importing 500 lb; the CBI Aggregate was less than 1 million lb (TSCA, 1979). Commercial production of the chemical in the United States was first reported to the U.S. Tariff Commission in 1967 (IARC V.27, 1982).

EXPOSURE

The primary routes of potential human exposure to 2,4-diaminoanisole sulfate are dermal contact and inhalation. Potential consumer exposure could occur for persons using hair dyes containing 2,4-diaminoanisole sulfate. The maximum concentration of the compound in hair-dye preparations is about 1.5%. Potential occupational exposure could occur for workers at chemical- and dye-production facilities, as well as workers using dyes containing 2,4-diaminoanisole sulfate to dye furs, leather, and textiles. Potential exposure of hairdressers and cosmetologists could occur while using hair dyes containing 2,4-diaminoanisole sulfate. In a 1978 report, NIOSH made no estimate of the potential worker exposure to the sulfate, but estimated 400,000 workers were possibly exposed to 2,4-diaminoanisole. Hairdressers and cosmetologists comprised the largest portion of this group (IARC V.27, 1982). According to NCI, substantial exposure of the population to 2,4-diaminoanisole sulfate is questionable.

REGULATIONS

2,4-Diaminoanisole sulfate is subject to reporting requirements under the Toxic Substances Control Act (TSCA) and the Superfund Amendments and Reauthorization Act (SARA). EPA has proposed regulating the chemical as a hazardous waste under the Resource Conservation and Recovery Act (RCRA). FDA regulates 2,4-diaminoanisole sulfate as a component of hair dyes and requires a warning label on cosmetic products containing the chemical. However, a court decision stayed the FDA regulation, pending determination of the potential human health risk from dermal exposure to the compound. FDA is continuing its consideration of the matter. NIOSH recommends that exposure be reduced to the lowest feasible concentration. OSHA regulates 2,4-diaminoanisole sulfate under the Hazard Communication Standard and as a chemical hazard in laboratories. Regulations are summarized in Volume II, Table B-35.